

# Wireless Power Transmission using Solar Power Satellite

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## ABSTRACT

From this paper we can transfer the power to earth without using any wires using satellite based system. by this satellite solar power based system we can reduce the transmission and distribution losses. by this system we can get more efficiency of power for future generations. in this paper we can study the various components of satellite based system and projects this technology as a bulk source of power generation in future. With the help of sps system we can reduce the costs of lines and get more efficiency of power for future resources

**Key words:** sps system, microwave generator, rec-tenna transmitting antenna

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## I. INTRODUCTION

The main problem in the power transmission system from one place to another place occurring more losses during transmission and distribution of electric power. We know that electricity is the most useful energy in the world for transferring of energy from one place to another by using overhead lines and underground cable by this methods we can get more losses in the line due to resistance in the lines. so we can avoid this losses by using solar power satellite based system without wires it is known as wireless power transmission using solar power satellite based system

## II. WIRELESS POWER TRANSMISSION

The wireless power transmission system was first invented by Nikola Tesla in the early 1900s which is over 100 years ago. He is the first person transmission of electric power to earth without using wires by spent his own money. That's why he is known as "father of wireless". The below figure shows the TESLA TOWER which was designed and constructed by tesla for transmitting of power to earth without wires



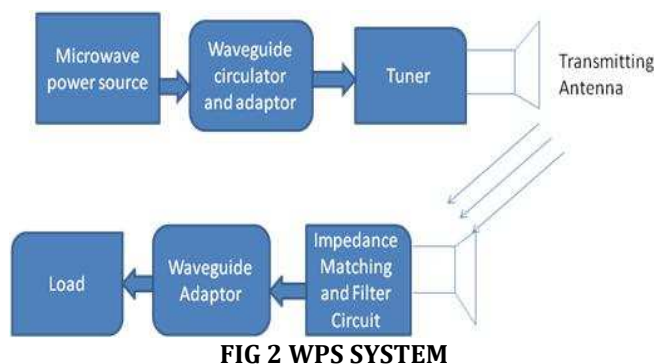
FIG 1 TESLA TOWER

In 1904, an airship ship motor of 0.1 horsepower is driven by transmitting power through space from a distance of least 100 feet. In 1961, Brown published the first paper proposing microwave energy for power transmission, and in 1964 he demonstrated a microwave-powered model helicopter that received all the power needed for flight from a microwave beam at 2.45 GHz from the range of 2.4GHz – 2.5 GHz frequency band which is reserved for Industrial, Scientific, and Medical (ISM) applications. Experiments in power transmission without wires in the range of tens of kilowatts have been performed at Goldstone in California in 1975 and at Grand Bassin on Reunion Island in 1997. The world's first MPT experiment in the ionosphere called the MINIX (Microwave Ionosphere Non-linear Interaction Experiment) rocket experiment is demonstrated in 1983 at Japan. Similarly, the world's first fuel free airplane powered by microwave energy from ground was reported in 1987 at Canada. This system is called SHARP (Stationary High - Altitude Relay Platform)

### III. WORKING PRINCIPLE OF WPT SYSTEM

We already know that wireless transmission system technology is not a present technology system. This system was already discussed by Nikola tesla in 1980. The main three parts of this system is microwave generator, rectenna and transmitting antenna. With the help of this concept in the transmission side, the microwave power source generates microwave power and the output power is controlled by electronic control circuits. The wave guide ferrite circulator which protects the microwave source from reflected power is connected with the microwave power source through the Coax – Waveguide Adaptor. The tuner matches the impedance between the transmitting antenna and the microwave source. The attenuated signals will be then separated based on the direction of signal propagation by Directional Coupler. The transmitting antenna radiates the power uniformly through free space to the rectenna.

In the receiving side, a rectenna receives the transmitted power and converts the microwave power into DC power. The impedance matching circuit and filter is provided to setting the output impedance of a signal source equal to the rectifying circuit. The rectifying circuit consists of Schottky barrier diodes converts the received microwave power into DC power. The whole wireless power transmission system can show in below figure

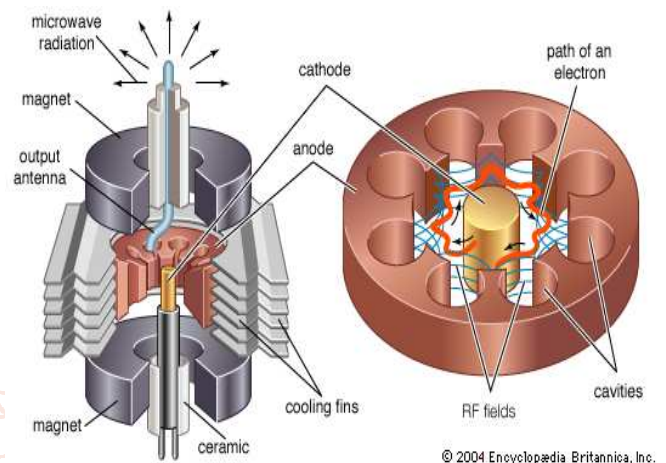


### IV. COMPONENTS OF WPS SYSTEM USING SPS SYTEM

The important parts are discussed only in wps system which was explained by below

#### A. MICROWAVE GENERATOR:

The microwave transmitting devices are classified as Microwave Vacuum Tubes (magnetron, klystron, Travelling Wave Tube (TWT), and Microwave Power Module (MPM)) and Semiconductor Microwave transmitters. Magnetron is the main part of in wps system which is shown in below figure. The microwave transmission often uses 2.45GHz or 5.8GHz of ISM band. The other choices of frequencies are 8.5 GHz, 10 GHz and 35 GHz. The highest efficiency over 90% is achieved at 2.45 GHz among all the frequencies.



**FIG 3 MAGNETRON**

#### B. TRANSMITTING ANTENNA :

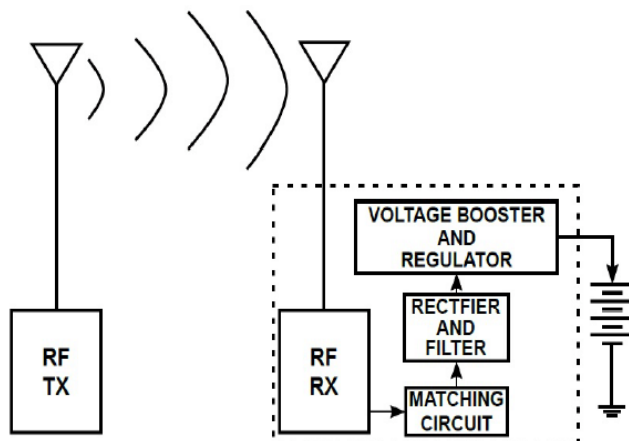
The antenna is a device which is used to interference between the electrical circuit and space and it is used to receive and transmit the signals with a particular range of frequency based in its size and shape. The transmitting antenna tower can show in below



**FIG 4 TRANSMITTING ANTENNA TOWER**

#### C. RECTENNA:

It is a device which is used to convert the electromagnetic energy in to dc electricity. This type device is used in wpt system to transfer the power by radio waves in this device it contains RF diode which connected to a dipole elements in dipole antenna. The diode is used to rectify the ac which is produced in antenna and convert in to dc power. The figure of rectenna is shown in below figure

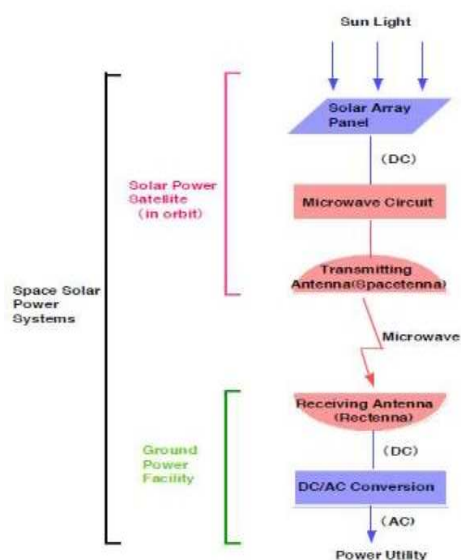


**FIG 5 RECTENNA**

## V. WORKING OF WPT USING SATELLITE BASED SYSTEM

The block diagram satellite based system shown in below figure

### FLOW CHART OF SOLAR POWER TRANSMISSION



**FIG 6 POWER FLOW DIAGRAM**

The complete assembly of the satellite shown in above. The solar panels are connected on either sides of the satellite. These solar panels are the main source of DC power. Microwaves are generated using a device called magnetron powered by DC supply. Photovoltaic cells are used for converting solar radiations into DC power. The generated DC power is fed to the magnetron having microwaves in the range 2.45 GHz to 2.54 GHz. The SPS systems use specially designed magnetrons which generate 3 to 5 KW power or more. Waveguide is a structure that guides waves such as electromagnetic waves, sound waves and microwaves. Furthermore, the microwaves that come out from the waveguide need to be transmitted to the receiving rectenna, via space.

## VI. THE ADVANTAGES, DISADVANTAGES AND APPLICATIONS DISCUSSED BELOW

### ADVANTAGES

- Unlimited energy source
- Zero fuel cost
- Zero co2 emission
- Compact size
- No radio frequency interference

### DIS-ADVANTAGES

- Initial cost is high
- No feasible
- High frequency signals should be supplied
- Possible health hazards

### APPLICATIONS

- It is used in battery charging
- It is used in sensors
- It is used in television
- It is used in headsets

## VII. CONCLUSION

The wireless power transmission using solar power satellite is discussed and advantages, disadvantages and applications also discussed.

By this technology we can decrease the losses in lines and get the more efficiency of ac power without using any wires, cables, insulators etc., by this wpt system using solar panel we can get sufficient power without any occurring losses.

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